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November 4, 1992

Ms. Donna R. Searcy
Secretary
Federal Communications Commission
1919 M Street, N.W.,
Washington, D.C. 20554

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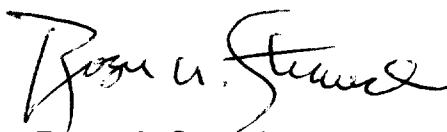
Subject: Comments on ET Docket No. 92-100 and GEN Docket No. 90-314

Kindly find attached one original and eleven copies of comments on the above mentioned NPRM from Teknekron Communications Systems, Inc. Kindly forward a copy of the comment to each of the Commissioners.

Any questions or clarifications may be directed to Christopher Flores at (510)-649-3883.

Thanking You,

Sincerely,



Roger A. Strauch
President and Chief Executive Officer



Dr. Adel Ghanem
Director, Systems Engineering

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TCSI Comments on PCS NPRM

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1. Introduction:

TCSI thanks the Commission for the opportunity to comment on the NPRM (ET Docket 92-100 and GEN Docket 90-314). TCSI shares the Commission's view about the importance of PCS to the creation of new telecommunications markets and the increase in productivity of industry as a whole.

Further, TCSI agrees with the principles of universality, speed of deployment, diversity of services, and competitive delivery that the Commission has adopted to guide its rulemaking in the PCS arena. While TCSI supports this NPRM in general, there are specific concerns that are detailed in the sections that follow.

2. Company Background:

TCSI is a leading developer and licensor of high value technology to the world's largest telecommunications companies, electronics product manufacturers, and corporate network users. Headquartered in Berkeley, California, TCSI enables its clients to offer new products and services based on personal communications systems and technologies as well as advanced network management systems.

The company derives its revenues from systems development services in addition to license fees and royalties generated by the commercial success of its technologies incorporated into its clients' products and services. TCSI employs approximately 200 people and reported revenues of \$44.8 million in 1991. The company made an initial public stock offering in July 1991 that is traded on the NASDAQ/National Market System under the trading symbol TCSI.

PCS represents the convergence of our personal communications and network management expertise. In the wireless area we have developed an IS-54 digital cellular chipset jointly with AT&T and Mitsui, we are discussing with major equipment manufacturers licensing our VSELP speech compression technology for the North American and Japanese digital cellular standards, and we are developing a CDMA digital cordless phone for the U.S. residential market. In network management, we have developed object-oriented applications on our Unix-based NMS/Core for a number of leading telecommunications vendors and service providers.

3. Areas of Full Agreement:

TCSI fully concurs with the NPRM in the following areas:

- Provision for operation of unlicensed PCS devices.
- Recognition (Rule 15.5) that unlicensed PCS devices are not required to protect Part 94 operations for which a license application is filed after July 16, 1992.
- Inclusion of voice (e.g., cordless telephones, wireless PBX) and data devices (e.g., wireless LANs) as potential unlicensed PCS devices.

4. Areas of Partial Agreement:

TCSI is in partial agreement with the NPRM in the following areas:

4.1 Spectrum Allocation for Unlicensed PCS devices:

Comment: We believe that the spectrum allocation from 1910 to 1930 MHz for unlicensed PCS devices is inadequate.

Discussion: Current estimates for immediate spectrum needs for unlicensed PCS is as high as 70 MHz. We suggest an additional 5 MHz spectrum from 1905 to 1910 MHz be allocated for a start with promise for an extra 10 MHz from 1895 to 1905 MHz and 15 MHz from 1975 to 1990 MHz for future growth.

4.2 Unlicensed PCS devices (Section 15.253(a)):

Comment: The list of potential unlicensed PCS devices should include integrated devices that support voice and data applications.

Discussion: It is very likely that integrated applications of the future will include transport of voice and data information. We believe that video applications should be permitted only if substantially more bandwidth is allocated; otherwise, they will cause excessive spectrum congestion to the detriment of voice and data services.

4.3 Channelization (Section 15.253 (b) (1) (2) (3)):

Comment: The narrowband devices should be allocated the 5 MHz spectrum from 1905 to 1910 MHz. The remaining 20 MHz of spectrum from 1910 to 1930 MHz should have the broadband and intermediate-band spectrum overlaid. Further, the intermediate-band spectrum should be increased to 2 MHz. Thus the overlaid spectrum will con-

tain: two 10 MHz blocks, overlaid by ten 2 MHz channels.

Table 1: Spectrum Allocations

Band	Max. Channel BW	Number of Channels
1905 - 1910 MHz	100 KHz	50
1910 - 1930 MHz	2 MHz	10
	10 MHz	2

Discussion: The narrowband spectrum should not be overlaid by either the broadband or intermediate-band spectrum; otherwise, a few broadband or intermediate devices could occupy the entire band locking out the narrowband devices. On the other hand, the narrowband devices have a sufficient number of channels to avoid the incumbent fixed microwave licensees and other narrowband devices.

The opposite condition is true for the broadband and intermediate-band devices. The current allocation does not allow these devices sufficient frequency agility to avoid interference. The overlay scheme better addresses the Commissions stated goal (Note 45) to “provide protection to incumbent fixed microwave licensees and flexibility for unlicensed PCS devices”. The overlay scheme provides more bandwidth for the broadband and intermediate devices to avoid interference from/to microwave devices and same-type devices.

Finally, Rule 15.253 (b) (1) (iii) recognizes that 2 MHz is the lower limit for the bandwidth of broadband devices. We suggest that it also be specified as the upper limit for the bandwidth for intermediate-band devices.

4.4 Power Limits (Section 15.253 (b) (1) (i) (2) (ii) (3) (ii)):

Comment: The power spectral density for all three types of devices should be *exactly* equal. Specifically, the broadband devices should be limited to 1 W, the narrowband devices should be limited to 10 mW, and the intermediate-band devices should be limited to 125 mW (or 200 mW if 2 MHz proposal is adopted). These levels correspond to a common power spectral density of 0.1W/MHz for all three types of unlicensed PCS devices.

Further, these power spectral densities should be specified as peak. Devices that do not use the full channel bandwidth should derate their output power appropriately.

Discussion: The current power limits produce non-equal interference as shown in the

following table. The next table shows the proposed power limits.

Table 2: Current Power Spectral Densities

Band:	Max. Channel BW	Peak_PWR	Max_PSD
1910-1920	100 KHz	1000 mW	0.1W/MHz
1920-1925	2 MHz	20 mW	0.2W/MHz
1925-1930	10 MHz	100 mW	0.08W/MHz

Table 3: Recommended Power Spectral Densities

Band	Max. Channel BW	Peak_PWR	Max_PSD
1905 - 1910 MHz	100 KHz	10 mW	0.1W/MHz
1910 - 1930 MHz	2 MHz	200 mW	0.1W/MHz
	10 MHz	1000 mW	0.1W/MHz

4.5 Emission Limits (Section 15.253 (b) (1) (ii) (2) (iii) (3) (iv)):

Comment: The proposed emission limits are adequate for only the adjacent channels. The following alternate channel emission limits should be added. Note that for the broadband devices the adjacent and alternate channel bandwidths should be defined in terms of the 6 dB bandwidth of the fundamental transmission.

Table 4: Recommended Emission Limits

Band	Adjacent Ch. BW	Emission Limit	Alternate Ch. BW	Emission Limit
1905 - 1910 MHz	100 KHz	33dB	100 KHz	63dB
1910 - 1930 MHz	2 MHz	40dB	2 MHz	70dB
	2-10 MHz	50dB	2-10 MHz	80dB

Discussion: If the proposed emission limits are allowed to cross the entire 1910-1930 MHz band the cumulative interference from multiple unlicensed PCS devices will be very serious. The addition of alternate channel limits provides for better co-existence of unlicensed PCS devices.

4.6 Frequency Stability (Section 15.253 (c)):

Comment: There should be no frequency stability requirement; or, at least, it should be changed to +/- 0.01 percent.

Discussion: The frequency stability requirement is not necessary as out-of-band emission limits provide sufficient safeguards against frequency drift. Nevertheless, the present requirement of 0.0001 percent (or 1 ppm) is very expensive for current technology and represents an unnecessary additional cost for unlicensed PCS devices.

4.7 Spectral Efficiency Requirements (Section 15.253 (d) (1) (3) (4)):

Comment: The requirement (d) (1) requiring the receiver to monitor the spectrum and prevent operation of the transmitter if another transmission is detected in the desired band of operation should be deleted.

Discussion: There are several reasons why this requirement should be dropped.

- This introduces a first-come-first-serve scenario. A PCS device (particularly a base unit) can seize the spectrum all the time by transmitting continuously.
- Licensed operations in the 1910-1930 MHz band are protected by Rule 15.253 (b) (7).
- For the requirement to be meaningful the detection level, the detection duration, the receiver sensitivity, etc. have to be rigorously defined.
- Robust operation of unlicensed PCS devices in the presence of interference should be a design challenge.

Comment: Compliance with the spectral efficiency defined in (d) (3) should be emphasized. The data rate in the spectral efficiency definition should be clearly stated to apply per intentional radiator.

Discussion: The spectral efficiency requirement is important to provide equal applicability for all the multiple access techniques - TDMA, FDMA, and CDMA.

Comment: The adaptive power control requirement (d) (4) should be modified to “.. automatically lower the output level. The power control should have one or multiple steps, each less than 5 dB, providing a range of 30 dB or more.” instead of “.. automatically lower the output level of the intentional radiator by at least one step of 10 dB or

more”.

Discussion: The present definition does not require a radiator operating for example at 8 dB above the necessary level from having to lower the output level. The present definition allows radiators to use 10 times more power than necessary. With the recommended definition the radiator will not transmit more than 5 dB above the necessary level.

5. Conclusion

TCSI applauds the Commission for steps it has taken so far to make PCS a reality. We seek the technical modifications described above in the rules governing the operation of unlicensed PCS devices. We believe these modifications will result in a more efficient and economical use of the allocated spectrum. We urge the Commission to speedily address these and other comments and finalize the rules for adoption of PCS